REMARKS

In response to the first Office Action dated March 23, 2006, the Applicant hereby requests reconsideration of the pending claims in light of the following. Applicant notes that the German case corresponding to the present application issued on May 12, 2005 as German Pat. No. DE 102 56 222 B4.

STATUS OF CLAIMS

Claims 1-25 as originally filed were pending.

Claims 1-3, 6, 8, 9, and 22-24 are amended.

Claims 1-25 are before the Examiner for consideration.

CLAIM REJECTIONS UNDER 35 U.S.C. § 112

In Section 1 of the Office Action, claims 1-25 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for the various reasons set forth in the Office Action. The claim amendments set forth above are believed to obviate this rejection. In particular, claims 1, 3, and 22 have been amended to remove the offending instances of the word "particularly." Claim 9 has been amended to remove the "range-within-a-range." Claims 6, 8, 23, and 24 have been amended to more succinctly define the claimed subject matter, in a manner believed to meet the requirements of 35 U.S.C. § 112, second paragraph. The Examiner is directed to Sections [0055] – [0057] of the present application for further explanation of the feature(s) recited in Claims 6, 8, 23, and 24.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

Claims 1-4, 19, 21, and 22 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 4,930,950 to Stadtfeld ("Stadtfeld"). The Applicant respectfully submits that Stadtfeld neither shows nor suggests each and every element/limitation of these claims as amended, as required for an anticipation rejection under 35 U.S.C. § 102(b), rendering these claims allowable over Stadtfeld.

To elaborate, Stadtfeld relates to a conventional 10-axis machine 50 for producing spiral bevel gears. (FIG. 1 from Stadtfeld is reproduced below.) The machine includes a base 10, a tool head 11 moveable in a direction 'A', and a work head 14 that is moveable both in a linear direction 'C' and in an angular direction 'B',

about axis 13. A cradle 17, rotatable in direction 'F', is mounted on the tool head 11. Attached to the cradle 17 is a series of adjustable drums 18, 19, 20, which control the eccentric, swivel, and tilt angles, respectively, of the tool head. For each bevel gear 22 to be manufactured, these drums are adjusted to position the tool 21 with respect to the work piece 22, and are then locked in place.

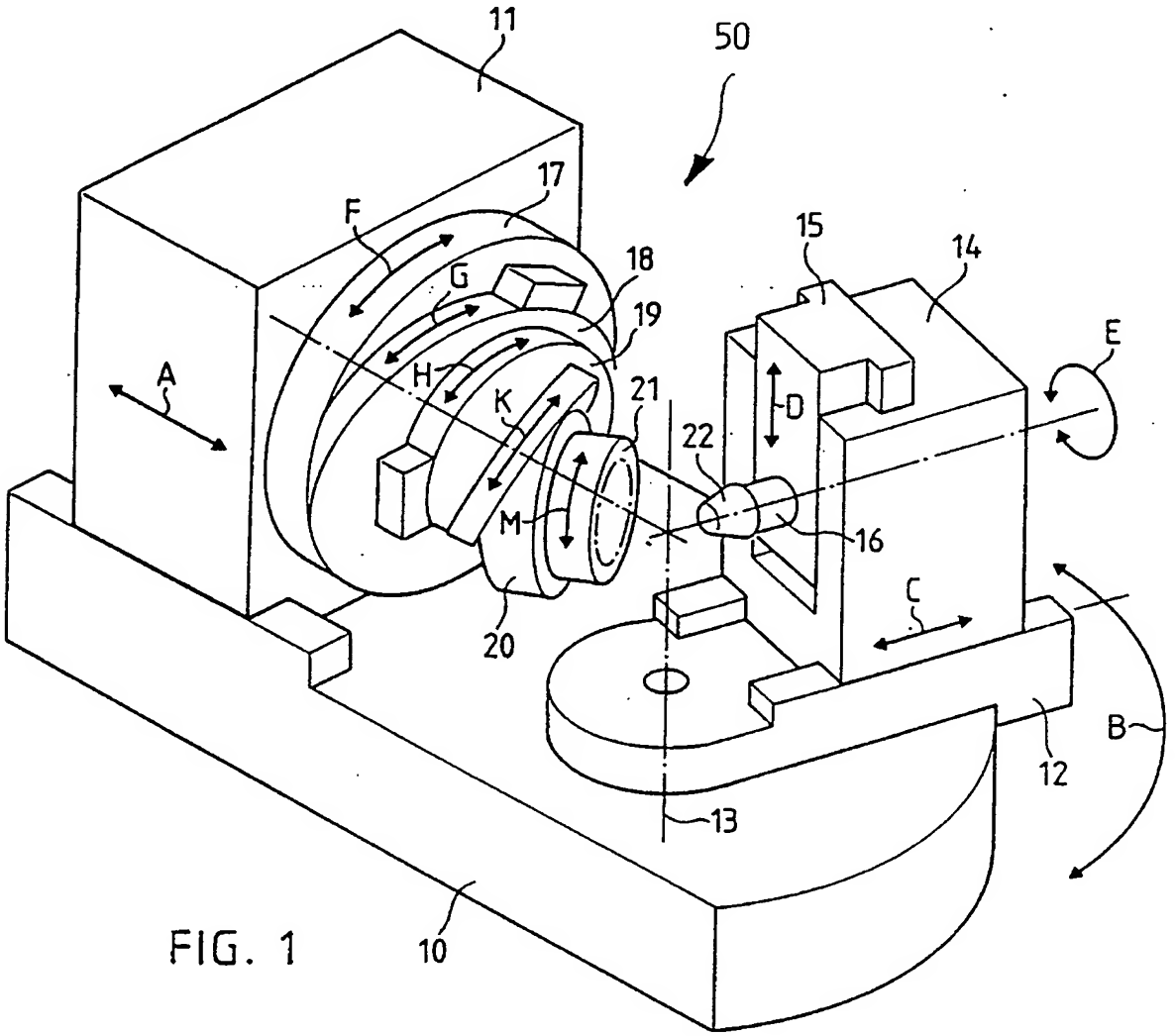


FIG. 1

In particular, as stated in Stadtfeld, "the eccentric drum 18, the Orientation drum 19 and the inclination drum 20, are pivoted or rotated into the respective required positions and clamped there at the beginning of the gear-cutting operation for producing a workpiece or gear wheel 22." Col. 4, lines 39-44. For this purpose, the machine includes clamping means 23, 24, 25 for each drum. See FIG. 2 in Stadtfeld. Even though drums 18, 19, and 20 are clamped

during the machining operation, the machine in Stadtfeld is a 10-axis machine, involving rotation or movement along ten pathways A, B, C, D, E, F, G, H, K, and M.

U.S. Pat. No. 5,580,298 to Stadtfeld ("Stadtfeld II") discusses this design in more detail.[1] FIG. 1 from Stadtfeld II is reproduced below.

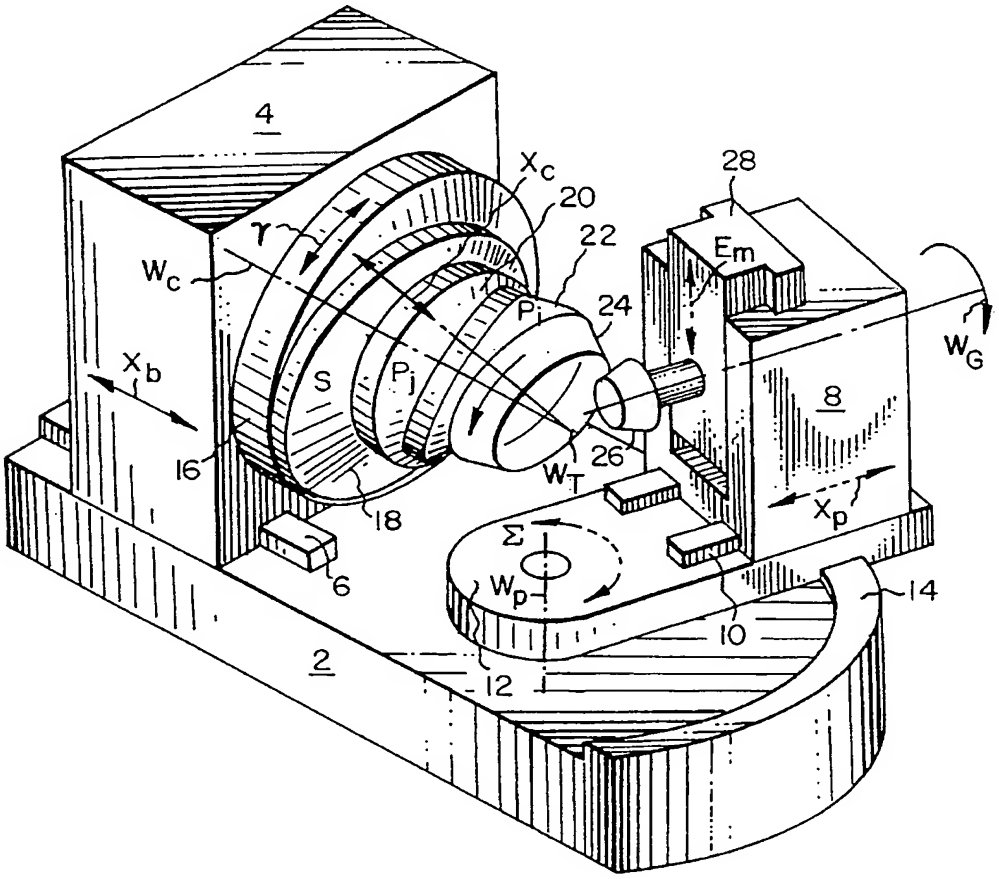


FIG. 1

Stadtfeld II explains the axes of movement of this machine in the following manner:

> Movement of tool head 4 on ways 6 defines the sliding base setting, Xb, to control the depth of cut. Positioning of slide 28 controls the vertical motion or hypoid offset, Em. Movement of work head 8 along ways 10 controls head setting or pitch cone setting, Xp. Motion of the worktable 12 about axis Wp sets the root angle, Σ. Rotational adjustment of drum 18 (eccentric angle) adjusts the spiral angle of the

[1] This patent corresponds to EP 0 784 525 B4, disclosed by way of the Information Disclosure Statement filed with the present application.

> work gear. Rotational adjustment of drums 20 and 22 sets the position of the cutter axis, swivel (angle Pj) and tilt (angle Pi) respectively, to adjust the flank profile and influence lengthwise crowing and mesh crowning. Rotation of the cradle 16 provides rotation of the generating gear (angle γ) about axis Wc. Axes WT and WG provide for rotation of the tool and work gear respectively.

Stadtfeld II, Col. 5, lines 12-32. Note that the tilt angle (angle Pi) is specifically described as being adjustable, for producing different gears.

In Sections [0004] – [0008] of the present specification, it is explained that the 10-axis Stadtfeld device, as shown above, has generally been replaced in the industry by CNC-controlled bevel gear machines having 6 axes, for purposes of simplifying the mechanical structure and required control algorithm, among other reasons. An example of a 6-axis machine is shown in FIG. 2 of Stadtfeld II, which is reproduced here:

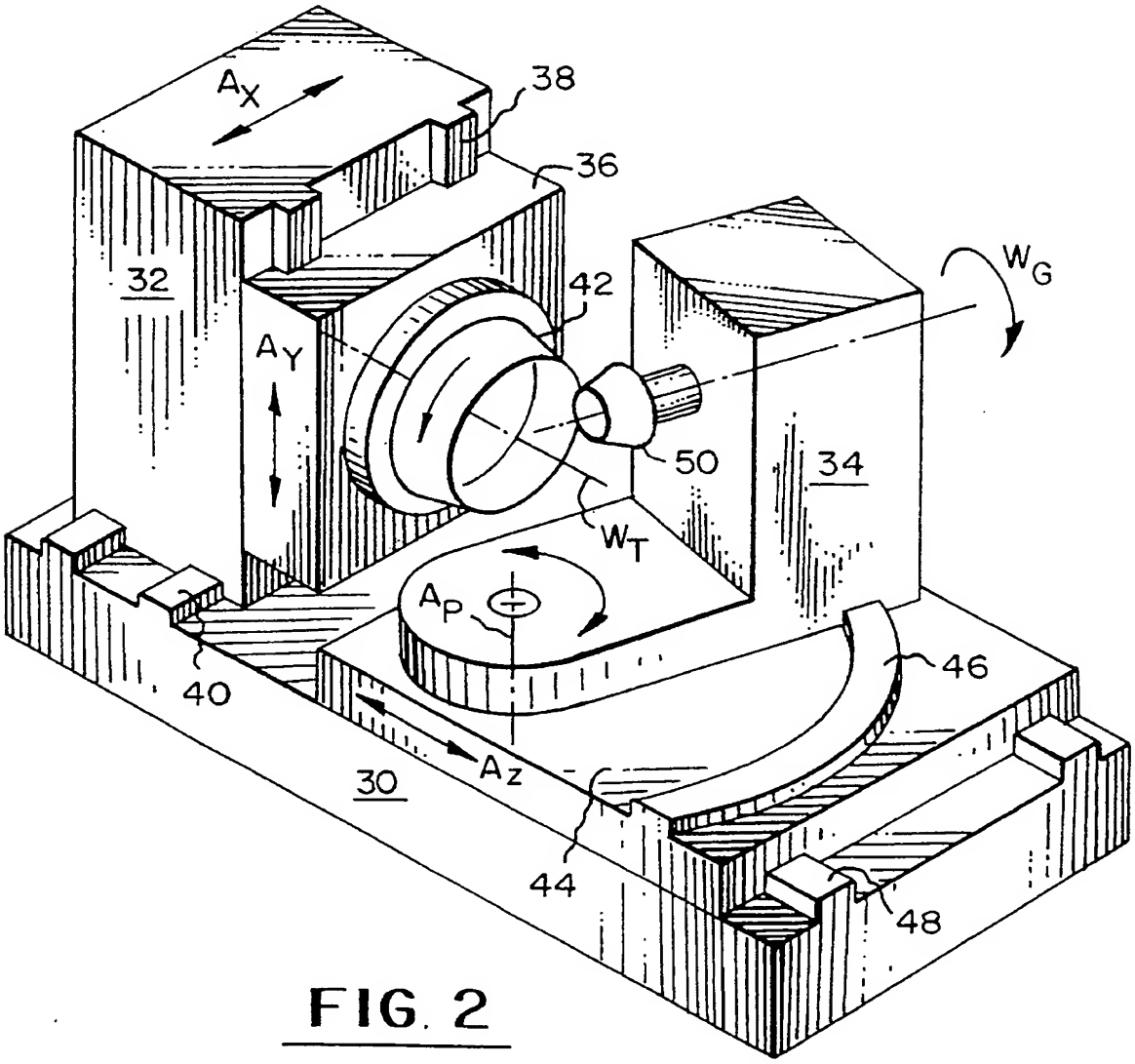


FIG. 2

In 6-axis CNC-controlled machines, the work gear spindle support has to be continuously pivoted about a vertical axis during the generating motion. In FIG. 2 above, for example, the work gear spindle 34 is pivoted about the vertical pivot axis Ap. As explained in Section [0004] of the present application:

> What all CNC-controlled machines with 6 axes have in common is that a work gear spindle support has to be continuously re-pivoted about a vertical axis during the generating motion. This is referred to as machine root angle pivoting. This machine root angle pivoting is necessary because the cutter head, which on a conventional mechanical generating machine moves on a curved cone surface in the case of a conical generating gear, is moved by a cross slide in one plane on a numerically controlled generating machine.

The 6-axis design presents certain drawbacks. As explained in Section [0005] of the present specification, the machine root angle pivoting of the work gear spindle support generally reverses its direction within one generating cutting operation. This alters the deformation of elastic machine elements in a load reversal, thereby causing inaccuracies in the bevel gear tooth surfaces produced. As further explained in Section [0007] of the present specification:

> The pivoting movement of the work gear axis about the vertical pivot axis generally has a reversal point. This means that the pivoting movement slows down as it approaches a maximum machine root angle, then reverses its direction and speeds up again. As already explained above, a pivoting movement of this nature entails control problems, since the movement must be braked and then accelerated again in the opposite direction. The load reversal also already mentioned above, which causes the form changes in the drive train of the pivoting mechanism, can result in undesired deviations on the flanks of the bevel gears produced.

These problems are solved by the present invention, in that the machine 10 (see FIG. 1 of the present application) has seven axes and a fixed tilt angle κ, but does not include an adjustable tilting mechanism. The 7th axis (namely, axis P) is used to adjust the bevel angle, but this axis is fixed during machining – there is no root angle pivoting. When machining a bevel gear, only six axes are in motion, namely, axes X, Y, and Z (translational axes) and axes O, T, and W (rotary axes). As indicated in Section [0009]:

> It is the object of the invention to design a machine and a method for CNC-controlled machining, particularly generating cutting or generating grinding, of spiral bevel gears with and without hypoid offset, in such a manner that no adjustable tilting mechanism is required for the tool axis, but nevertheless, no machine root angle pivoting of one of the spindle supports is required either.

As described above, Stadtfeld discloses a device wherein the tilt angle is adjustable, and must be adjusted for each gear to be machined. In the present invention, and as recited in the claims, the tilt angle is fixed and non-adjustable. In the Office Action, the Examiner stated "the axis of cutter 21 may be adjusted to a tilt angle relative to the axis of rotation 40 of drum 17, but it is considered to be 'non-adjustable' in the sense that various clamp means such as 23, 24, 25, may lock that adjusted position such that it does not change during rotation of the drum 17." The Applicant respectfully submits that this is an unreasonably broad interpretation of

"non-adjustable," in that claim 1 specifically states that "the tool spindle forms **for all bevel gears to be machined on the machine** a fixed, non-adjustable tilt angle..." (emphasis added). In Stadtfeld, on the other hand, to machine different bevel gears, the tilt angle must be adjusted, i.e., for all bevel gears to be machined on the machine, the tilt angle must be different and therefore adjusted between operations. However, to move this case forward to a condition for allowance, Applicant has amended claim 1 so that this limitation is phrased in a different manner. In particular, claim 1 has been amended to recite that "the tilt angle is non-adjustably fixed for all possible machining operations of said machine." In Stadtfeld, to carry out all possible machining operations of the device disclosed therein, the tilt angle would have to be adjusted.

Furthermore, regardless of whether the tilt angle in Stadtfeld is adjustable, Stadtfeld fails to disclose other elements in claims 1-4, 19, 21, and 22. In particular, as explained above, in the device of the present invention there is no machine root angle pivoting of a spindle support during a machining operation. (With reference to FIG. 1 from Stadtfeld II above, it is to be remembered that the rotation of the worktable 12 about the axis Wp is what is referred to in the art as "root angle pivoting." Similarly, in FIG. 1 from Stadtfeld, rotation of the work head 14 about axis 13 constitutes root angle pivoting.) This feature is specifically recited in claims 1 and 22:

> the second spindle, forming a reference plane with its axis (W or T) and the orientation axis (O), is, for a bevel gear to be machined on the machine machine, adjustable in its angular position about a pivot axis (P) which pivot axis is perpendicular to the reference plane, **but the second spindle does not change its angular position during the machining operation,...**

Claim 1 (emphasis added)(claim 12 includes similar language). In Stadtfeld, there is a first spindle with a tilt angle, e.g., cutter head 21, and a second spindle 16 for the workpiece 22. However, the angular position of the second, workpiece spindle 16 is changed during the machining operation, by rotation of the headstock 14 about axis 13 in the direction of arrow B. As such, Stadtfeld does not disclose a device where a second spindle "does not change its angular position during the machining operation," as recited in claim 1.

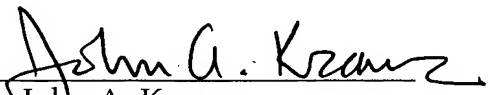
Because Stadtfeld fails to disclose a machine for machining spiral bevel gears wherein the machine has a non-adjustable tilt angle and no root angle pivoting during machining, in the manner set forth in claims 1 and 22, Stadtfeld cannot anticipate the present invention as characterized in these claims under 35 U.S.C. § 102(b). As such, claims 1 and 22 are believed allowable over the prior art of record. (It should further be noted that Stadtfeld II and other 6-axis machines all utilize root angle pivoting during machining operations, meaning that the present invention is also novel over such references.) Claims 2-4, 19, and 21 are believed allowable as depending from an allowable base claim, namely, claim 1.

CONCLUSION

In view of the foregoing, it is respectfully submitted that pending claims 1-25 are in condition for allowance, and action to that effect is earnestly solicited.

Pursuant to 37 C.F.R. § 1.136, the Applicant hereby petitions for a one month of extension of time, thereby extending the period for response to and through July 24, 2006 (July 23, 2006 being a Sunday). Authorization is hereby given to charge any fees owed to our Deposit account No. 13-0235.

Respectfully submitted,

By 
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